

REMARKS/ARGUMENTS

Claims 1 and 3-7 are active in this application, claim 2 having been cancelled. Claim 1 has been amended to incorporate the limitations of claim 2 and to specify that the softener (c) ranges meets the relationship (2) $0 \leq W_c/(W_a+W_b+W_c) \leq 0.5$. Additionally, the claim has been amended to specify that the polymer composition has a sea-island morphology. These amendments are supported by the claims as originally presented and the specification at page 6, lines 3-4. New claims 3-7 have been added and are supported by the specification at pages 8, 9 and 11. No new matter has been added by these amendments.

The present invention relates to a polymer composition containing an addition polymerization-based block copolymer (a), an acrylic resin (b), and a softener (c), wherein the addition polymerization-based block copolymer (a) has a weight average molecular weight of 30000 to 200000 and is at least one selected from block copolymers comprising at least one polymer block A and at least one polymer block B, and hydrogenated products of the block copolymers; the polymer block A comprises mainly an aromatic vinyl compound unit containing at least 1% by mass of an alkylstyrene-derived structural unit (I) in which at least one alkyl group having 1 to 8 carbon atoms is bound to a benzene ring; the block copolymer B comprises a conjugated diene compound unit; and the components of the polymer composition are present in respective proportions (by mass) so that the following relationships (1) and (2) hold:

$$0.05 \leq W_b/W_a \leq 2 \quad (1)$$

$$0 \leq W_c/(W_a+W_b+W_c) \leq 0.5 \quad (2)$$

where W_a , W_b , and W_c are the amounts (by mass) of the components of the polymer composition: the addition polymerization-based block copolymer (a), the acrylic resin (b) and the softener (c), respectively, wherein the polymer composition has a sea-island morphology;

and wherein the polymer composition, when formed into a 2mm thick sheet-shaped article and tested for the Taber abrasion according to JIS K 6264, gives a Taber abrasion of 100mm³ or less, the test conducted by abrading the sheet with an H-22 abrasion disk at 1000rpm while applying a 1kg load. Applicants have found that by requiring their polymer compositions to meet the requirements of the present claims, namely with respect to the ratio of amounts of blocks A and B and the amount of softener (c), and by requiring that the composition have a sea-island morphology, the resulting compositions have significantly improved scratch and abrasion resistance.

The claims stand rejected under 35 U.S.C. 103 over Kobayashi et al; Khandpur et al; Hiroyuki in view of Foss or Zucchini or Erickson et al or Chemical Marketing reporter; or Chundry et al. As acknowledged by the Examiner, none of these references discloses specifically the present invention, with no example shown that meets the requirements of the present invention. Additionally, none of the references teach or suggest that by requiring the components to meet the requirements of the present claims, namely that the styrene component be an alkyl substituted styrene, or that the softener be limited in accordance with relationship (2), or that the composition have a sea-island morphology, one can obtain improved scratch and abrasion resistance compared to compositions outside the requirements of the present invention.

Applicants have provided within the present specification data in Tables 1 and 2 showing the criticality of the present invention requirements, particularly the use of an alkylstyrene, the level of softener permitted, etc. Tables 1 and 2 are reproduced below:

Table 1

	Ex. 1	Ex. 2	Ex. 3	Ex. 4	Ex. 5	Ex. 6	Ex. 7	Ex. 8
Polymer composition (Parts by mass)								
(a) addition polymerization-based block copolymer								
Block copolymer 1	70	54	40	36	47	42	65	
Block copolymer 2								70
(b) Acrylic resin								
Acrylic resin 1	30	36	55	54	47	43	20	30
(C) Softener								
DIANA PROCESS PW-380		10	5	10	6	15	15	
Irganox 1010*	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
Scratch resistance (μm)	1.7	2.0	5.4	4.8	2.6	2.3	5.9	3.1
Taber abrasion (mm^3)	33	28	39	27	14	16	34	49
Light transmission (%)	87	82	88	83	82	82	85	84
Permanent set (%)	1.2	1.5	3.8	1.0	6.4	1.8	0.9	1.8
Hardness (Type A)	80	70	90	80	74	70	60	81
Tensile strength at break (MPa)	27	23	25	20	15	14	26	24
Elongation at break (%)	350	280	260	210	240	270	420	320
MFR (g/10 min)	1.3	11	5.5	13	9.5	55	49	1.5

*Irganox1010 : Hindered phenol-based antioxidant (Ciba Specialty Chemicals Co., Ltd.)

Table 2

	Comp. Ex. 1	Comp. Ex. 2	Comp. Ex. 3	Comp. Ex. 4	Comp. Ex. 5	Comp. Ex. 6	Comp. Ex. 7
Polymer composition (Parts by mass)							
(a) addition polymerization- based block copolymer							
Block copolymer 1	30	24	70	27	70	47	54
Block copolymer 3							
(b) Acrylic resin							
Acrylic resin 1	70	56		18	30	47	36
(C) Softener							
DIANA PROCESS PW-380		20	30	55		6	10
Irganox 1010	0.25	0.25	0.25	0.25	0.25	0.25	0.25
Scratch resistance (μm)	16	23	11	22	11	12	12
Taber abrasion (mm^3)	230	310	320	>500	410	350	450
Light transmission (%)	79	82	81	82	83	84	88
Permanent set (%)	Rupture	6.5	5.0	7.2	4.7	5.0	4.0
Hardness (Type A)	97	83	37	10	85	75	70
Tensile strength at break (MPa)	4.8	8.3	14	4.5	15	15	13
Elongation at break (%)	180	200	650	600	300	210	260
MFR (g/10 min)	48	>100	64	>100	0.6	2.8	1.9

*Irganox1010 : Hindered phenol-based antioxidant (Ciba Specialty Chemicals Co., Ltd.)

As shown above, when the present invention compositions (Examples 1-8 of Table 1) having the required alkylstyrene component, and meeting the relationships of the present claims, the resulting composition has significantly better scratch and abrasion resistance compared to the Comparative Examples. Importantly, Comparative Examples 1-4 used the same p-methylstyrene polymer as in the present invention, but did not meet the other requirements of the claim. Namely, Comp. Examples 1 and 2 do not meet relationship 1 of the present claim, since the amount of acrylic resin is more than twice the amount of alkylstyrene resin. Comp. Example 3 does not meet the present claims since there is no acrylic resin. Comp. Example 4 does not meet relationship 2 of the present claims, since the amount of softener is more than 50% of the composition. Comp. Examples 5-7 differ from the present invention by the use of styrene based polymers, but no alkylstyrene polymer units. Accordingly, these data show the criticality of the type of polymers used (alkylstyrene vs. styrene), the ratio of styrenic to acrylic polymer (relationship 1) and the amount of softener (relationship 2). None of the cited references disclose or suggest the criticality of these characteristics. The results provided in the present application thus adequately rebut any assertion of obviousness over the cited references, and the rejections should be withdrawn.

Claims 1 and 2 (it is assumed that the statement of claims 1-20 by the examiner was merely a mistake) stand rejected under 35 U.S.C. 112. This rejection is obviated by the current amendment. Applicants note that the softener is an optional component of the present invention composition, and must meet the relationship (2) of the present claim 1.

Claims 1 and 2 stand rejected for obviousness type double patenting over U.S. Patent 7,247,674. This rejection is traversed since there is no overlap between the claims of the present invention and the claims of the '674 patent, and the claims of the '674 patent cannot suggest the present invention as claimed. In particular, the claims of the '674 patent require the use of an α -methylstyrene. The α -methylstyrene of the patent and the alkylstyrene of the

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present invention are not the same, since the α -methylstyrene has a methyl group attached to the α carbon of the vinyl group of the styrene, while the present invention alkylstyrene requires that the alkyl group be attached directly to the benzene ring. Accordingly, the claims of the patent cannot render the present invention obvious and the rejection should be withdrawn.

Applicants submit that the application is now in condition for allowance and early notification of such action is earnestly solicited.

Respectfully submitted,

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